

NRL Report 5988

UNCLASSIFIED

**HIGH TEMPERATURE PROPERTIES
OF SODIUM AND POTASSIUM**

**TENTH PROGRESS REPORT
FOR PERIOD 1 JANUARY TO 31 MARCH 1963**

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ABSTRACT

The experimental program to measure various thermophysical properties of sodium, potassium, and their vapors at elevated temperatures is continuing at this laboratory. Preliminary data for three PVT experiments with potassium to 2516°F are presented in this report.

PROBLEM STATUS

This is an interim report on the problem; work is continuing.

AUTHORIZATION

NRL Problem C05-15
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INTRODUCTION

Measurement of thermophysical properties of sodium and potassium and the evaluation of these metals as possible working fluids has continued under the sponsorship of the National Aeronautics and Space Administration.

INDIVIDUAL PROPERTY TESTS

Pressure-Volume-Temperature Measurements

PVT measurements of potassium were started during this period, and three experiments have been completed. The apparatus and experimental procedure used in the sodium measurements (1) were satisfactory for the potassium measurements. These preliminary data are shown in Figs. 1, 2, and 3. Work is being continued, and it is anticipated that the five additional experiments required to complete this phase should be complete by the middle of June, 1963.

Upon completion of the PVT measurements for potassium, those for sodium will be resumed.

Heat Capacity Measurements

The heat capacity measurements of sodium have been completed (1), and the measurements on potassium are in progress. The Inconel container with heavier walls (for higher temperatures and pressures) has been filled with potassium, checked for strength at 2100° F, and measurements are in progress. The container with thin walls, to be used over the low vapor pressure range to approximately 1560° F, has been made and is ready for filling. These measurements should be completed in June.

Density Measurements

Density measurements of sodium and potassium at lower temperatures will be continued in the north upright furnace and should be completed in June.

Surface Tension Measurement

Surface tension measurements of potassium will be started at the completion of the PVT measurements of potassium.

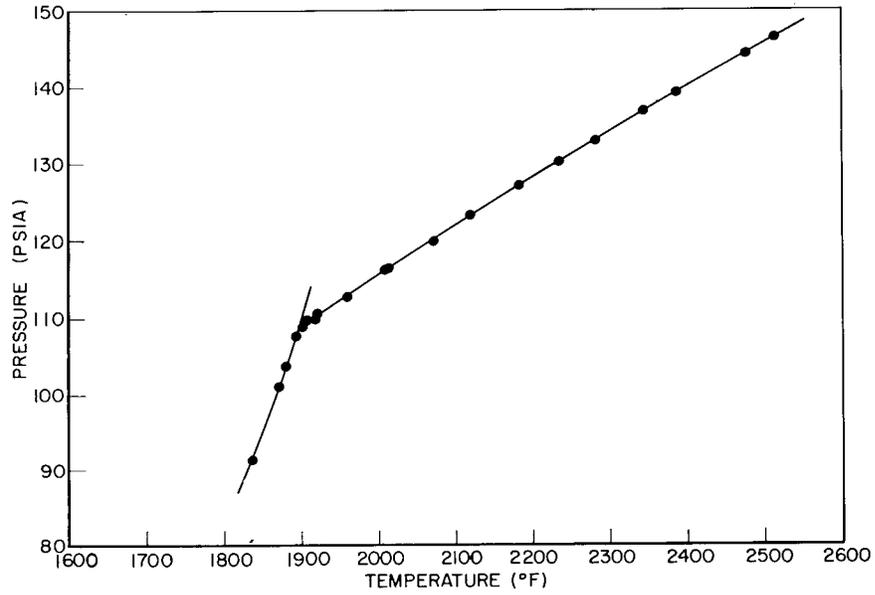


Fig. 1 - Potassium pressure-volume-temperature data null-point experiment No. 8

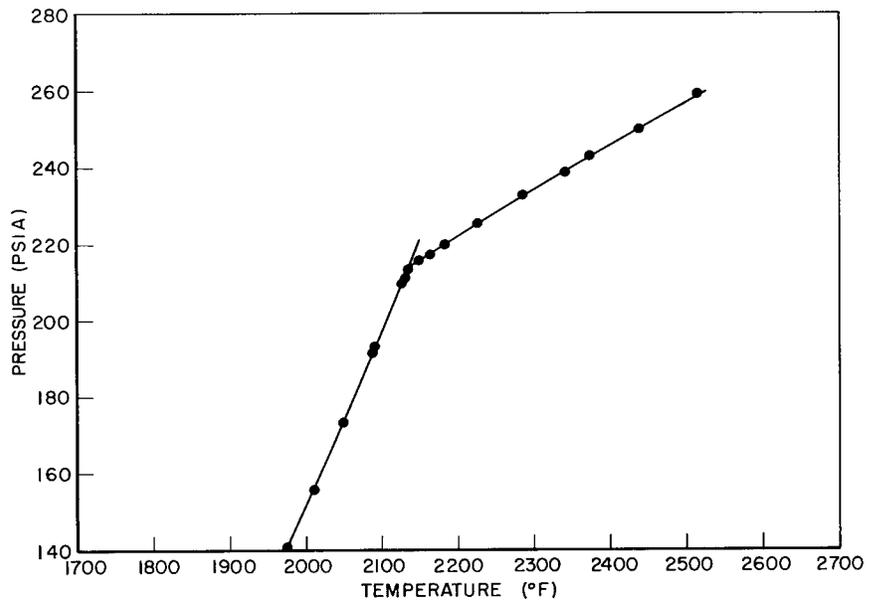


Fig. 2 - Potassium pressure-volume-temperature data null-point experiment No. 10

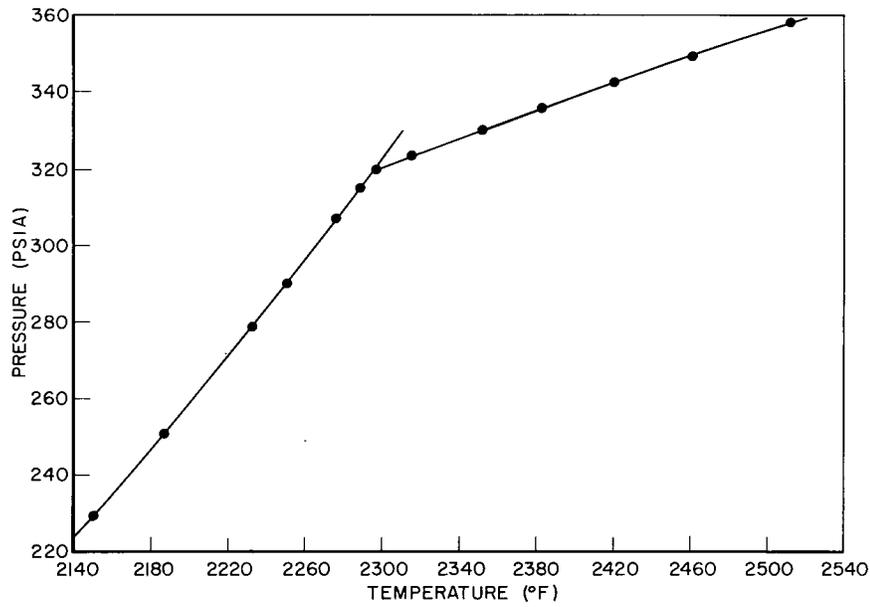


Fig. 3 - Potassium pressure-volume-temperature data
null-point experiment No. 11

REFERENCE

1. Ewing, C.T., Stone, J.P., Spann, J.R., Kovacina, T.A., and Miller, R.R., NRL Report 5964, May 20, 1963